Catalogue of American Amphibians and Reptiles.

ZWEIFEL, RICHARD G. 1974. *Lampropeltis zonata.*

Lampropeltis zonata (Lockington ex Blainville) California Mountain Kingsnake

?[*Coluber*] *(Zacholus) zonatus* Blainville, 1835:293. Type-locality, "Californie". Holotype formerly in Paris Museum, not now known to exist, collected by Paul Emile Botta.
Bellophis zonatus Lockington, 1876:52. Type-locality, "Northern California" (see remarks under *L. z. zonata*). Syntypes destroyed, formerly California Acad. Sci. 334, 335, collected by "Paymaster Stanton, U.S.N."
Ophibolus triangulus var. *zonatus:* Garman, 1883:155 (but not p. 67). New combination.
Ophibolus pyrrhomelas: Cope, 1892:610. Considers *zonatus* of Lockington a synonym.
Coronella zonata: Boulenger, 1894:202. New combination.
Lampropeltis zonata: Van Denburgh, 1897:167. New combination.
Lampropeltis pyrrhomelaena multicincta: Stejneger, 1902:153. Rejects use of *zonatus*, considers *multicincta* a race of *pyrrhomelaena.*
Ophibolus zonatus: Ditmars, 1907:357. New combination.
Lampropeltis pyromelaena multicincta: Stejneger and Barbour, 1917:89. Unjustified emendation of spelling of *pyromelana.*
Lampropeltis pyromelana multicincta: Grinnell and Camp, 1917:184. First combination with original spelling of *pyromelana.*
L[*ampropeltis*]. *multicincta*: Blanchard, 1920:5. New combination.
Lampropeltis zonatus: Ditmars, 1939:147. Unjustified emendation of ending.

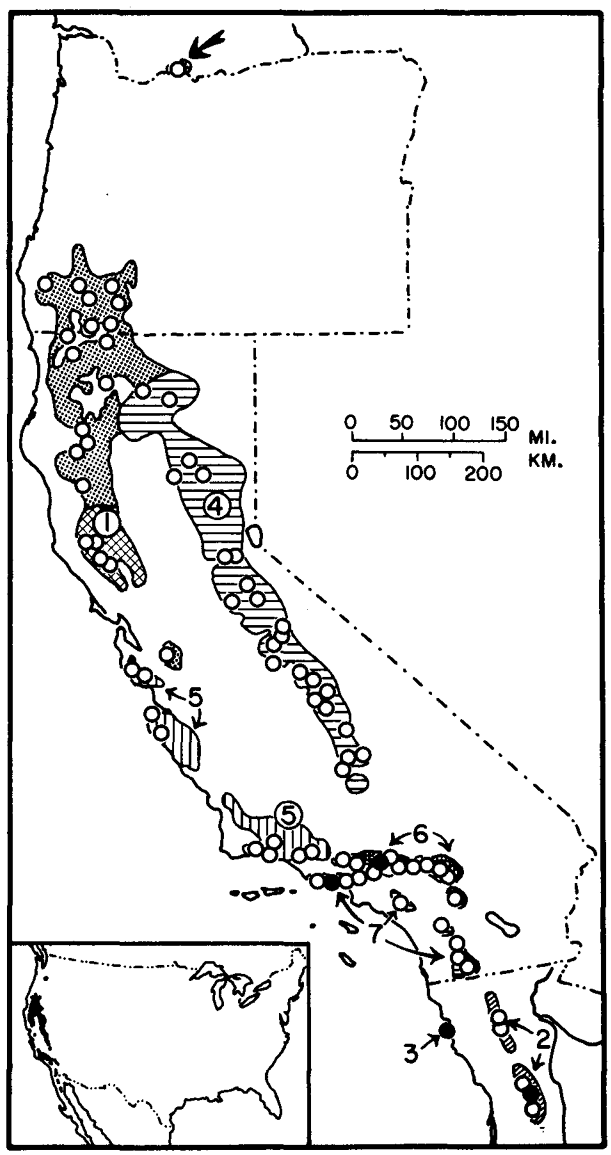
• CONTENT. Seven subspecies are recognized: *agalma*, *herrerae*, *multicincta*, *multifasciata*, *parvirubra*, *pulchra* and *zonata.*

• DIAGNOSIS. *L. zonata* is likely to be confused only with *L. pyromelana* or with western races of *L. triangulum* (both allopatric to *zonata*, but see diagnosis of *L. z. herrerae*). *L. pyromelana* has the snout largely white, whereas it is black or black with red markings in *zonata*. In *triangulum* with a pattern similar to that of *zonata*, the white rings tend to broaden as they approach the ventrals rather than remain narrow as in *zonata*. Most individuals of these two species also differ in numbers of ventral and subcaudal scales: ventrals 194–227 in *zonata* (Zweifel, 1952) but 175–198 in westernmost *triangulum* (*L. t. taylori*; Tanner and Loomis, 1957); subcaudals respectively are 46–62 and 38–54.

• DESCRIPTIONS. For general morphology, see Blanchard (1921) and Van Denburgh (1922). Zweifel (1952) analyzed variation in color pattern and tabulated counts of subcaudal and ventral scales. The basic color pattern of the body is a series of alternating black and white rings. In one subspecies (*herrerae*) and in occasional individuals of another (*multicincta*) the pattern lacks red, but typically each black ring encloses a lateral red area on each side, and the red areas may coalesce mid-dorsally, forming a red ring between two black rings. For purposes of description, the basic unit of color pattern is a triad—a pair of white rings together with the black or red and black areas between them. Variation in red is expressed as the per cent of total body triads in which the lateral red areas join mid-dorsally, and ranges from 0 to 100. The first white ring, located on the back of the head, may have its posterior margin on or anterior to the last supralabial (anterior position), at the angle of the mouth (intermediate position), or behind the angle of the mouth (posterior position). The prefrontal area may be black or may show light pigment (generally red in life). Differences in numbers of body triads, amount of red on body and snout, and position of the first white ring characterize the subspecies.

• ILLUSTRATION. A painting in color in Stebbins (1959) was republished in Stebbins (1966, 1972). Color illustrations also appear in Grinnell and Storer (1924), U. Peters (1972), and Shaw and Campbell (1974). Black and white photographs of preserved specimens of all subspecies except *L. z. herrerae* are in Zweifel (1952); and photographs or drawings appear in numerous publications (e.g. Blanchard, 1921; Bocourt, 1886; Ditmars, 1940; Dixon, 1967; Perkins, 1949; Schmidt and Davis, 1941; Stebbins, 1954; Van Denburgh, 1897, 1922; Wright and Wright, 1957).

• DISTRIBUTION. The main body of the range is from northern Kern County, California, northward along the western flank of the Sierra Nevada into southwestern Oregon and southward in the eastern part of the Coast Ranges (avoiding the moist coastal region) to the area north of San Francisco Bay. South of San Francisco Bay, the species occurs in disjunct populations in the Coast, Transverse and Peninsular Ranges, terminating in the Sierra San Pedro Martir of Baja California. A remarkably isolated population is found on tiny South Todos Santos Island near Ensenada, Baja California. The species may be present on Santa Catalina Island off the coast of southern California, as inferred from the following statement by Holder (1910: 194): "Between Little Harbor and the Isthmus . . . I saw a beautiful coral snake with alternate rings of red and black." The northern limit of the range is the vicinity of White Salmon, Washington, at the south-central edge of the State. This area is over 200 miles from the closest verified records in Oregon. Stebbins (1966:159, map 146) gave a questionable "Old record for Maupin, Wasco Co., Oregon." There are no specimens to document this rumored occurrence (R. M. Storm, *in litt.* to



MAP. Solid symbols mark type-localities; open symbols indicate other localities. Areas of intergradation are stippled.

Stebbins). The reported presence of *zonata* in southeastern Washington (Johnson, 1939) remains unverified by specimens.

Zweifel (1952) listed locality records. No records published subsequently or localities for the many specimens I have examined since then fall outside the range hypothesized in that paper (fig. 5). Bury ("1970" [1971]) provided additional locality records in northwestern California, Richards (1958) and Walker (1946) gave records in Yosemite National Park, and Glaser (1970) listed localities in Riverside County, California. Slater (1963) summarized records for Washington (his "White Swan" is a lapsus for "White Salmon"). Gordon (1935) and Fitch (1936) gave records for Oregon.

Authors have considered *L. zonata* an indicator species for the Transition Life Zone (e.g. Hall and Grinnell, 1919, referring to the Sierra Nevada), but the species occurs virtually at sea level on shrub-covered South Todos Santos Island, and in chaparral at elevations below 1000 feet in the Santa Monica Mountains of Los Angeles County, California, as well as up to 8000 feet at the upper limit of the Yellow Pine belt in the Sierra Nevada.

• Fossil Record. No fossils have been assigned to this species. Brattstrom (1955b) described *L. intermedius* from the lower Pleistocene of southeastern Arizona and considered it possibly ancestral to *L. zonata* and other Recent species.

• Pertinent Literature. Information on the habitat and habits of this species is confined largely to brief, anecdotal remarks; see Bogert (1930), Cunningham (1955), Ditmars (1940), Grinnell and Storer (1924), Linsdale (1932), and Pequegnat (1945). Klauber (1931, 1939) discussed seasonal and life-zone distribution. Mosauer (1935) determined the top speed of an individual as 0.321 m/sec (0.72 miles/hour). Shaw and Campbell (1974) reported that a snake lived 15 years 4 months in capitivity. Wentz (1953) described the repeated return of a snake displaced up to ¼ mile away. Food taken in the wild includes lizards (*Sceloporus* and *Eumeces*: Cunningham, 1959; Fitch, 1936; Grinnell and Storer, 1924; Van Denburgh, 1922), lizard eggs (Fitch, 1936), nestling russet-backed thrushes (Petrides, 1941), and quail eggs (Wentz, 1953). Food taken in captivity includes lizards (*Sceloporus* and *Eumeces*: Bogert, 1930; Fitch, 1936), a snake (*Thamnophis*: Blanchard, 1921), and mice (Kauffeld, 1969). Brattstrom (1965) and Cunningham (1966) recorded body temperatures. Cunningham (1959) mentioned a clutch of 3 eggs and Zweifel (1952) a brood of 8. Perkins (1952) reported an incubation period of 63 days. Brattstrom (1955a) and Hecht and Marien (1956) discussed the color pattern of *L. zonata* in relation to mimicry. Cochran (1961), Crippen (1962) and Slevin and Leviton (1956) included this species in type lists. Sloan (1973) mentioned *zonata* in relation to California conservation laws.

Authors have agreed in placing *zonata* in the *triangulum* species group of *Lampropeltis* (Blanchard, 1921). Smith (1942) and Tanner (1953) considered *L. pyromelana* the closest relative, whereas Tanner and Loomis (1957), Gehlbach and Baker (1962), and Zweifel (1952) thought *L. triangulum* more closely related. For biogeographic speculation, see Peabody and Savage (1958), Savage (1960), and Zweifel (1952).

• Nomenclatural History. Possibly the first reference to this snake was Blainville's (1835) description of "(*Zacholus*) *zonatus*," but the specimen was lost by the 1880's (Bocourt, 1886) and the original description is too incomplete to permit definite assignment to a species. Lockington (1876) described *Bellophis zonatus*, evidently seeking to preserve Blainville's name, but initiated a prolonged argument over whether *zonatus* Blainville, *zonatus* Lockington or *multicinctus* Yarrow was the correct specific name. Discussions relevant to the question are found in Stejneger (1902), Linsdale (1932), Burt (1936), J. Peters (1938), Klauber (1943a, 1943b) and Smith and Taylor (1945). I follow the last authors in the use of *zonata* and in style of citing authorship.

Judged from his inclusion of California within the range given, Cope (1875) had material of *zonata* but referred it to *Ophibolus pyrrhomelas*. Later (1892) he listed *zonatus* (of Lockington) as a synonym of that species, but his specimens included examples not only of these two species but also of a western race of *L. triangulum*. Although Boulenger (1894) and Van Denburgh (1897) recognized *zonata* as a full species, the former considered *pyromelana* a junior synonym of *zonata*, whereas the later recognized the specific distinctness of the two forms. Stejneger (1902) and Stejneger and Barbour (1917) persisted in considering *zonata* ("*multicincta*") a race of *pyromelana*, but after Blanchard (1920, 1921) the two were not again confused. (The apparent anomaly that one author considered *pyromelana* a senior synonym and another a junior synonym of *zonata* is explained by the dual publication of *zonata* by Blainville in 1835 and by Lockington in 1876. These dates bracket that of the publication of *pyromelana*.) In counterpoint to this confusion, Yarrow's (1882) description of *multicinctus* as a subspecies of *getulus* misled Boulenger (1894) and Cope (1900), but not Van Denburgh (1897), who recognized it as a synonym of *zonata*. Only Garman (1883) formally relegated *zonata* to the synonymy of *triangulum* (as a subspecies), but others (Zweifel, 1952; Gehlbach and Baker, 1962) have suggested possible conspecificity.

This species was known for many years by the vernacular name "Coral Kingsnake." Klauber (1934) preferred the name "Mountain King Snake" because of the association of the name "Coral" with venomous snakes, but he later (1943a) reverted to the latter name. The common name used here was adopted by Conant *et al.* (1956).

• Etymology. The Latin *zonata*, meaning banded, derives from Greek *zonē*, a girdle or belt; the Greek *agalma* means a delight, or an ornament; Alfonso Herrera was a Mexican naturalist of the late 19th and early 20th centuries; *multicincta* and *multifasciata* derive from the Latin *multus*, meaning many, *cinctus*, meaning banded, and *fascis*, a bundle or band; *parvirubra* is from the Latin *parvus*, meaning little, and *ruber*, meaning red; *pulchra* is Latin for beautiful.

Table
Body Pattern Characteristics of *Lampropeltis zonata*

Subspecies	N	Body Triads[1]	% Split Triads[1]
agalma	7	41–52 (45.3 ± 1.5)	61–100 (75.1 ± 5.7)
herrerae	10	36–41 (38.2 ± 0.6)	0 (0.0)
multicincta	48	23–48 (35.0 ± 0.9)	0–84 (24.9 ± 3.1)
multifasciata	24	26–45 (35.3 ± 0.9)	65–100 (93.2 ± 2.1)
parvirubra	87	35–56 (40.8 ± 0.4)	4–100 (38.9 ± 2.5)
pulchra	58	26–39 (32.8 ± 0.4)	9–100 (67.7 ± 3.4)
zonata	4	24–30 (27.2)	63–96 (83.8)

[1] Range, mean, and standard error of mean.

1. *Lampropeltis zonata zonata* (Lockington ex Blainville)

?[*Coluber*] (*Zacholus*) *zonatus* Blainville. See species account.
Bellophis zonatus Lockington. See species account.
Lampropeltis multicincta multifasciata: Klauber, 1943a:76, in part. New (preferred) combination.
Lampropeltis zonata zonata: Klauber, 1943a:76, in part. New (alternate) combination.

• Diagnosis. Differs from other subspecies in having the following combination of characters: anterior head scales dark; first white ring in posterior position; 30 or fewer body triads; more than 60 per cent of triads split dorsally by red.

• Remarks. Blanchard (1921:222) quoted a personal communication from Van Denburgh stating that the types of *zonata* were labeled Santa Barbara, in southern California. Zweifel (1952:156–158) presented arguments favoring a northern California origin.

2. *Lampropeltis zonata agalma* Van Denburgh and Slevin

Lampropeltis agalma Van Denburgh and Slevin, 1923:2. Type-locality, "Alcatraz, San Pedro Martir Mountains, Lower California [Baja California Norte], Mexico." Holotype, California Acad. Sci. 56856, adult male collected on 16 June 1923 by Joseph R. Slevin (examined by author).
Lampropeltis zonata: Linsdale, 1932:378. Considers *agalma* a synonym.
Lampropeltis multicincta: Stejneger and Barbour, 1933:108. Consider *agalma* a synonym.
Lampropeltis multicincta agalma: Klauber, 1943a:76. New (preferred) combination.
Lampropeltis zonata agalma: Klauber, 1943a:76. New (alternate) combination.

• Diagnosis. Characterized by a high triad count (more than 40 on the body), considerable red on the body, and red on the snout. This combination occurs only rarely in one other subspecies, *L. z. multifasciata*.

3. *Lampropeltis zonata herrerae* Van Denburgh and Slevin

Lampropeltis herrerae Van Denburgh and Slevin, 1923:2. Type-locality, "South Todos Santos Island, Lower California [Baja California Norte], Mexico." Holotype, California Acad. Sci. 56755, adult male collected on 25 May 1923 by Joseph R. Slevin (examined by author).
Lampropeltis multicincta: Stejneger and Barbour, 1933:109. Consider *herrerae* a synonym.
Lampropeltis multicincta herrerae: Klauber, 1943a:76. New combination.
Lampropeltis zonata herrerae: Smith and Taylor, 1945:85. New combination.

• DIAGNOSIS. Distinguished by lack of red in the pattern. Occasional *L. z. multicincta* lack red (Klauber, 1932), but have the first white ring placed posteriorly, with its rear margin posterior to the angle of the mouth (typically anterior in *herrerae*). *Lampropeltis getulus californiae* (ringed phase) may be superficially similar, but has white on the anterior labials and snout.

4. *Lampropeltis zonata multicincta* (Yarrow)

Ophibolus getulus multicinctus Yarrow, 1882:440. Type-locality, "Fresno, Cal.," presumably obtained in the Sierra Nevada east of Fresno. Holotype, U. S. Natl. Mus. 11753, collected by Gustav Eisen in 1878 (examined by author).
Coronella getula: Boulenger, 1894:197. Considers *multicinctus* a synonym.
Ophibolus getulus boyli: Cope, 1900:921. Considers *multicinctus* a synonym.
Lampropeltis multicincta multicincta: Klauber, 1943a:76, in part. New (preferred) combination.
Lampropeltis zonata multicincta: Klauber, 1943a:76, in part. New (alternate) combination.

• DIAGNOSIS. Distinguished by the following combination of characters: usually (90 per cent of 47 specimens) less than 60 per cent of body triads dorsally split by red (rarely no red at all: Klauber, 1932); first white ring in posterior position; snout black.

5. *Lampropeltis zonata multifasciata* (Bocourt)

Coronella multifasciata Bocourt, 1886:616. Type-locality, "Californie." Holotype in Paris Museum, collected by M. de Cessac (not examined by author).
Ophibolus pyrrhomelas: Cope, 1892:610. Considers *multifasciata* a synonym.
Coronella zonata: Boulenger, 1894:202. Considers *multifasciata* a synonym.
Lampropeltis zonata: Van Denburgh, 1897:167. Considers *multifasciata* a synonym.
Lampropeltis pyromelana multicincta: Grinnell and Camp, 1917:185. Consider *multifasciata* a synonym.
Lampropeltis multicincta: Blanchard, 1921:222. Considers *multifasciata* a synonym.
Lampropeltis multicincta multifasciata: Klauber, 1943a:76, in part. New (preferred) combination.
Lampropeltis zonata zonata: Klauber, 1943a:76, in part. New (alternate) combination.
Lampropeltis zonata multifasciata: Zweifel, 1952:159. New combination.

• DIAGNOSIS. Characterized by large amounts of red on the body and anterior head scales and usually (23 of 25 specimens) fewer than 41 body triads. The only other race regularly with red on the snout, *L. z. agalma*, has 41 or more triads.

6. *Lampropeltis zonata parvirubra* Zweifel

Lampropeltis multicincta multicincta: Klauber, 1943a:76, in part. New (preferred) combination.
Lampropeltis zonata multicincta: Klauber, 1943a:76, in part. New (alternate) combination.
Lampropeltis zonata parvirubra Zweifel, 1952:160. Type-locality, "¼ mi. NW of Falling Springs Resort, 2 mi. SW of Crystal Lake Park, San Gabriel Mountains, Los Angeles County, California." Holotype, Mus. Vertebrate Zool. (Univ. California, Berkeley) 42407, adult male collected 8 May 1946 by Robert C. Stebbins (examined by author).

• DIAGNOSIS. The first white band is in the anterior position, there are typically 37 or more body triads (91 per cent of 87 specimens), and fewer than 60 per cent of the triads are split by red (79 per cent of 87 specimens); the snout is dark.

7. *Lampropeltis zonata pulchra* Zweifel

Lampropeltis multicincta multifasciata: Klauber, 1943a:76, in part. New (preferred) combination.
Lampropeltis zonata zonata: Klauber, 1943a:76, in part. New (alternate) combination.
Lampropeltis zonata pulchra Zweifel, 1952:162. Type-locality, "near Crater Camp, Santa Monica Mountains, Los Angeles County, California." Holotype, Laurence M. Klauber 38667 (now in collection of San Diego [California] Society of Natural History), adult male, collector and date of collection unknown (examined by author).

• DIAGNOSIS. The first white band is in the anterior position; there are typically 36 or fewer body triads (90 per cent of 58 specimens), and 60 per cent or more of the triads are split by red (71 per cent of 58 specimens); the snout is dark.

COMMENT

Study of additional specimens may show that the area of intergradation between *zonata* and *multicincta* is less extensive than presently supposed (see map). A single specimen from Mt. Hamilton, southeast of San Francisco Bay, has fewer triads (19) than any other *L. zonata*, and each triad is split by red. Though mapped as an intergrade between *zonata* and *multifasciata*, this specimen may represent an isolated population sufficiently well differentiated to warrant subspecific recognition.

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